

Rocky Mountain region and the Great Plains section. At Huron, S. Dak., the temperature fell to 13°, breaking all previous records there for so late in the season. The frost and freeze occurred as forecast and the resulting damage was, as has already been stated, serious over a wide area. The movement of this high-pressure area was sluggish, with the result that frost occurred successively on four nights in much of the southeastern part of the district. Another frosty period occurred at the close of the month in portions of the Lake region, and fruit and vegetables suffered further injury in lower Michigan. Most of these frosts were forecast.

Storm warnings.—The storm-warning season on the Great Lakes opened on the 10th—about five days earlier than usual. Prior to that date three advisory warnings were issued for Lake Michigan. These were on the 1st, 4th, and 8th. In the first two cases winds of storm force occurred over the lake. Those of the 4th were severe in certain cases where thunderstorms were an accompaniment. Thus, at Chicago the 5-minute maximum velocity was at the rate of 58 miles an hour, with an extreme velocity of 66 miles an hour. Furthermore, the Dines pressure tube anemometer registered a gust at the rate of 77 miles an hour.

After the beginning of the storm-warning season proper, either storm or small-craft warnings were issued on seven occasions.

On the night of the 12th northeast storm warnings were displayed along the west shore of Lake Michigan from Chicago to Sheboygan. Verifying winds occurred as forecast.

The next storm warning of importance was issued on the 19th for the upper Lakes. A disturbance of considerable intensity was at that time over the upper Mississippi and lower Missouri Valleys, with a cold high pressure area over the northwest—the same high-pressure area that later caused the severe freeze referred to in a previous paragraph. On the evening of this date the warnings were extended over the lower Lakes. They were verified on the upper Lakes and on extreme western Lake Erie.

Storm warnings were again issued on the 21st for all the Great Lakes except Lake Superior. These were verified only in part, but fresh to strong winds were general.

A timely small-craft warning for all the Great Lakes was issued on the night of the 25th, and again on the following night for the upper Lakes.

A well-defined storm was centered on the morning of the 29th over Missouri and appeared to call for storm warnings on Lakes Erie and the southern portions of Huron and Michigan. However, the storm took an east-southeast course, and the only verifying velocity reported was that at Chicago.—*C. A. Donnel.*

NEW ORLEANS FORECAST DISTRICT

Over the middle Mississippi Valley and western tributary basins, especially the basins of the White, Arkansas, Ouachita, and Red Rivers, heavy rainfall from April 7 to 16 resulted from low pressure over the Southwestern States, while the pressure was high over the Great Lakes and the north-central districts; and very heavy rains from the 19th to the 21st occurred during the passage of a trough of low pressure followed by an area of unusually high pressure. Occurring while a great flood was in progress, this remarkably heavy April rainfall resulted in far higher water on the Mississippi River, from Cairo to near the mouth, than had ever previously been recorded.

Southeast storm warnings were displayed from Morgan City to Brownsville at 8 p. m. of the 12th, because of a well-defined disturbance over the Rio Grande Valley. This disturbance moved slowly and the warnings were continued at 8 p. m. of the 13th, small-craft warnings having been displayed meanwhile on the Louisiana coast east of Morgan City. The warnings were verified.

Southeast storm warnings were displayed on the Texas coast from 8:30 p. m. of the 17th to 8:30 p. m. of the 19th because of a trough of low pressure which was attended by strong southerly winds to gales on the Texas coast.

On the night of the 20th–21st an area of high pressure advanced rapidly to the Texas coast, after the manner of a winter “norther,” and northerly gales reached the east coast of Texas in the early morning of the 21st. Northwest storm warnings were displayed at 8:30 a. m. of the 21st on the Texas and Louisiana coasts and were justified; “norther” advices for Tampico, Mexico, were issued at this time.

Frost warnings for the northwestern and occasionally for the northeastern portion of the district were issued on the 1st, 17th, 20th, and 21st, the warnings of the 21st applying also to most interior sections of the southern portion. Conditions generally occurred as forecast.—*R. A. Dyke.*

DENVER FORECAST DISTRICT

Temperatures averaged considerably below normal in Montana, Wyoming, and northern Utah, and above normal in Colorado, New Mexico, and Arizona. There was an excess of precipitation in Wyoming and eastern Montana; elsewhere in the district amounts were below normal. The noteworthy feature of the month was the stormy weather in Wyoming extending from the 10th to the 16th, inclusive. During most of this week snowfall was state-wide and almost continuous. The amounts in the southern and eastern parts of the State were heavy, the accumulated depth on the ground at Cheyenne being 10 inches on the 14th. Traffic of all kinds, including the transcontinental air mail, was delayed considerably during this period. While livestock suffered considerably, there were no great losses. Warnings of frost or freezing temperature were issued almost every day, mostly for western Colorado, but occasionally for eastern Colorado, New Mexico, and southern Wyoming; these warnings were generally verified. Advices of fresh to strong winds were furnished the air mail services in southern Wyoming and eastern Colorado on the 2d, 3d, 8th, 9th, and 18th. No cold-wave warnings were issued.—*E. B. Gittings.*

SAN FRANCISCO FORECAST DISTRICT

The barometer was low over the lower latitudes of the ocean at the beginning of the month, a condition precedent to rather general rains in the Pacific States for a few days thereafter and calling for small craft warnings on the central California coast on the 1st. The barometer rose gradually over the ocean south of latitude 40°, while a disturbance which proved to be of persistent character developed in the upper Gulf of Alaska. A series of offshoots from the latter passed inland between the 2d and 7th, the last of which required the display of warnings at seaports in Oregon and Washington on the 6th. On the 8th the center of low pressure shifted inland from the Gulf of Alaska to the Great Basin consonant with a change in orientation of the major axis of the Pacific high to a north-south trend. This situation prevailed until the 13th of the month, and during this

time temperatures over most of the district were below normal. Frost warnings were required for all or parts of Washington, Oregon, northern California, and Idaho from the 8th to the 13th, inclusive. This cold period was terminated by the entrance of a storm from the northern ocean on the 14th which required the display of storm warnings at northern ports, and this was followed by two successive depressions which formed in the upper Gulf of Alaska. At the same time a very strong and widespread increase in pressure took place over other parts of the northeast Pacific Ocean, and an oceanic HIGH developed similar in character to that which had occupied the ocean during the early part of the month when lows generated in the upper Gulf of Alaska. With the passing of the last low-pressure area from this sector the axis of the Pacific HIGH assumed a north-south direction, and southwest gales, for which warnings were displayed at northern ports on the 17th, were followed by colder weather in Washington, Oregon, Idaho, and Nevada. Frost warnings were issued for these States on the 18th, 19th, 20th, and 21st. The frosts which occurred on the two latter dates were unusually severe, especially in eastern Washington, eastern Oregon, and Idaho, where several stations reported the lowest April temperatures of record. No general warnings were issued thereafter until the close of the month.—*Thomas R. Reed.*

RIVERS AND FLOODS

By H. C. FRANKENFIELD

The great flood in the lower Mississippi Valley continued throughout the month and can not yet be properly discussed. After the flood has finally subsided a special report will be made in the form of a MONTHLY WEATHER REVIEW SUPPLEMENT. Perhaps it will be sufficient at this time to state only that the flood from Cairo, Ill., southward was the greatest in the history of the lower Mississippi Valley, although from New Orleans, La., to the Gulf of Mexico not the greatest as to actual stages, as the premeditated cutting of the levee at Caernavon, La., depressed the flood crest at New Orleans at least 2 to 2½ feet, and possibly a little more.

The following table shows the crest stages at certain river stations where they exceeded previous records, and also the highest recorded stages previous to 1927:

Station	Present flood crests		Previous records	
	Stage (feet)	Date (1927)	Stage (feet)	Date
Cairo, Ill.	56.4	Apr. 20	54.7	Apr. 4, 1913 ¹
Helena, Ark.	56.8	Apr. 26-27	55.2	Apr. 22, 1913
Arkansas City, Ark.	60.5	Apr. 21	58.0	Apr. 22, 1922 ¹
Greenville, Miss.	54.7	do.	52.1	Apr. 25, 1922 ¹
Vicksburg, Miss.	58.7	May 4	55.0	Apr. 28, 1922 ¹
Natchez, Miss.	56.5	do.	55.3	Apr. 26, 1922
Baton Rouge, La.	47.8	May 15	45.7	May 16, 1922
Donaldsonville, La.	37.1	May 15, 16, 17	35.9	Do.
Yazoo City, Miss.	37.4	May 5	36.5	—, 1882
Alexandria, La.	42.4	May 8	41.8	July 6, 1908
Melville, La.	46.8	May 14, 15, 16	45.9	May 14, 1922 ¹
Pine Bluff, Ark.	32.4	Apr. 21	30.5	May 22, 1892

¹ And subsequent dates.

There were no high waters of consequence in the rivers of the Atlantic and East Gulf drainage, merely a few local rises to the flood stage or slightly higher, and without material losses.

The Ohio River was in moderate flood from Evansville to Mount Vernon, Ind., on April 16 and 17, and remained

at very high stage throughout the month below the mouth of the Wabash River.

On account of frequent rains, the interior rivers of the State of Ohio were quite high during the month, although there were only a few minor overflows without resulting damage. The same was true of the Wabash River system, the rivers of which had been very high during the month of March also. The Tennessee River was not in flood during the month except at Johnsonville, Tenn., from April 15 to 18.

The floods in the upper Mississippi system as well as those in the Arkansas and Red systems will be treated as a portion of the great flood. It may be remarked that the Illinois River was continuously in great flood throughout the month.

Heavy rains on April 7 and 8 and again on April 18 and 19 over the drainage area of the Arkansas River from Wichita, Kans., to the Kansas-Oklahoma line caused more or less severe floods in the tributary streams and a crest of 20.0 feet, 5.0 feet above flood stage, in the Arkansas River at Arkansas City, Kans., on April 9.

The loss and damage, mainly along the tributary streams, amounted, as reported, to \$235,500, of which \$105,000 was in prospective crops. The reported value of property saved through the warnings was \$45,000.

West Gulf drainage.—A series of heavy rains during the second and third decades of the month resulted in sustained floods of fair proportions in the Sabine, Neches, and Trinity Rivers, for which warnings were issued as required, beginning with April 13. A great quantity of livestock and other movable property was moved upon receipt of the warnings, and the reported value of property saved thereby was \$50,000. Losses as given aggregated \$58,500, all in the Trinity River area, and about equally divided between prospective crops and business suspension. A moderate flood in the Guadalupe River of Texas from April 14 to 18 was also well forecast, and virtually no losses resulted. There were also moderate floods from April 4 to 7 and April 27 to May 5 in the Rio Grande from below Albuquerque to San Marcial, N. Mex., that were well forecast. No reports of damage were received.

Pacific drainage.—No rises of consequence occurred except in the Colorado River and tributaries within the State of Colorado. They passed off without special incident.

River and station	Flood stage	Above flood stages—dates		Crest	
		From—	To—	Stage	Date
ATLANTIC DRAINAGE					
James: Columbia, Va.....	Feet 18	Apr. 23	Apr. 23	Feet 18.5	Apr. 23
EAST GULF DRAINAGE					
Etowah: Canton, Ga.....	11	Apr. 11	Apr. 11	12.7	Apr. 11
Pearl: Jackson, Miss.....	20	Apr. 3	Apr. 9	21.9	Apr. 6
West Pearl: Pearl River, La.....	13	(¹) Apr. 16	Apr. 6 Apr. 19	16.4 13.5	Feb. 18 Apr. 18
MISSISSIPPI DRAINAGE					
Ohio:					
Evansville, Ind.....	35	(¹) Apr. 14	Apr. 6 Apr. 18	39.9 36.4	Mar. 25 Apr. 16
Dam No. 48, Cypress, Ind.....	35	(¹) Apr. 15	Apr. 5 Apr. 18	39.1 35.5	Mar. 26-29 Apr. 17
Mount Vernon, Ind.....	35	(¹) Apr. 13	Apr. 10 Apr. 20	40.7 37.2	Mar. 31 Apr. 17
Shawneetown, Ill.....	35	(¹) Apr. 13	Apr. 24 Apr. 24	44.3 47.2	Apr. 1 Apr. 18
Paducah, Ky.....	43	Apr. 13	Apr. 24	47.2	Apr. 20
Cairo, Ill.....	45	(¹)	(²)	56.4	Apr. 20
Tuscarawas: Gnadenhutten, Ohio.....	9	Apr. 3	Apr. 3	9.4	Apr. 3
Scioto: Larue, Ohio.....	11	Apr. 2	Apr. 2	11.8	Apr. 2
Green: Lock No. 2, Rumsey, Ky.....	34	(¹) Apr. 16	Apr. 6 Apr. 19	40.6 34.2	Mar. 27 Apr. 17-18

¹ Continued from last month.

² Continued at end of month.